

Reproducible Switching Memory Effect Studied By Impedance Spectroscopy

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The reproducible switching and memory effect in thin film colossal magnetoresistive (CMR) materials has been further studied. A resistive memory device was made in a sandwich structure comprised of Au (or Pt)/ $\text{Pr}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ (PCMO)/ $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ (YBCO). Both the PCMO(001) film and c-oriented YBCO crystalline films were epitaxially grown by pulse laser deposition (PLD), while the Au layer was sputtered and the Pt layer was deposited by e-beam evaporation. Here the YBCO film was used as an atomic template for PCMO growth and as a bottom conductive electrode, but not used for its superconducting properties at low temperatures. We have characterized the temperature dependence of the device resistance change $R(T)$ upon electric pulse switching. We have also measured the impedance spectroscopy $Z(T,\omega)$ of the device in the temperature range of 77K to 300K and the frequency range from 10 to 10^6 Hz for both the low- resistance and high-resistance states of the resistive memory device. The influence of intrinsic film defects on switching and fatigue properties of the non-volatile resistive memory device, and the switching mechanism itself will be discussed.